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ABSTRACT

This study was designed to determine whether regular Head Start teachers trained as "experimenters" could produce two different teaching modes (combinations of techniques) in two consecutive sessions, using the same lesson content. Each of six Head Start teachers was asked to teach a 10-minute classification lesson to four children, using a set of assorted objects and teaching in a specified mode (e.g., Giving to the Group). Then, with another group of children, the teacher was to replicate the lesson, shifting to her second targeted mode (e.g., Asking Individuals). The problem to be investigated was whether teachers trained to observe, classify, and modify their own teaching behavior would be able to shift from one mode to another, if lesson goal and materials were kept constant. Also of interest were questions related to variability of teacher behavior within treatments and the general problem of experimental control in classroom studies. Results indicated that despite individual variability the teachers were quite effective in altering their behavior on the experimental variable. They exhibited a high level of performance both in producing their assigned modes and in shifting from one distinct mode to another. (Author/CS)

EXPERIMENTAL SHIFTING OF TEACHING MODES IN PRESCHOOL

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Abstract

This study was designed to determine whether regular Head Start teachers trained as "experimenters" could produce two different teaching modes (combinations of techniques) in two consecutive sessions, using the same lesson content. Would training to observe, classify and modify their own teaching behavior enable them to shift from one mode to another, keeping lesson goal and materials constant? Also of interest were questions related to variability of teacher behavior within treatments and the general problem of experimental control in classroom studies.

Each of six Head Start teachers were assigned randomly to two teaching modes. Each teacher was asked to teach a 10-minute classification lesson to four children, using a set of assorted objects and teaching in a specified mode (e.g., Giving to the Group). Then, with another group of children, the teacher was to replicate the lesson, shifting to her second targeted mode (e.g., Asking Individuals).

Results indicated that despite individual variability the teachers were quite effective in altering their behavior on the experimental variable. They exhibited a high level of performance both in producing their assigned modes and in shifting from one distinct mode to another. Although the task was implemented in all modes, several types of variation in lesson content appeared related to teaching mode.

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EXPERIMENTAL SHIFTING OF TEACHING MODES IN PRESCHOOL¹

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The scarcity of well-controlled experimental classroom studies and the need for observational data on treatment implementation is well documented (Rosenshine & Furst, 1971). A recent and welcome trend in educational research has been the development of more precise instrumentation for monitoring classroom events and the use of observational data in studies designed to describe and evaluate curriculum packages (e.g., Siegel & Rosenshine, 1972); to compare model programs and their effects (Miller & Dyer, 1970); and to examine the effect of the experimental manipulation of discrete instructional variables (Church, 1971; Hughes, 1971, 1973; Nuthall & Church, 1973). These sorts of endeavors have led to a growing body of data which clearly point up the complexity of the instructional situation, the vast number of interrelated classroom variables, and, as such, contribute to a better understanding of the difficulties encountered in the implementation of classroom experiments.

Classroom experimentation entails the crucial task of getting the treatment variable implemented consistently across classes while standardizing all other (non-targeted) aspects of the instructional situation across experimental conditions. With the advent of observational methods for monitoring classrooms and measuring fidelity of teacher behavior to treatment, it has become painfully apparent that these sorts of "laboratory" conditions have not been and perhaps cannot be achieved in the classroom setting. The main source of the difficulty appears to lie in two related phenomena: the interrelatedness and contingent variation of certain classroom events and the persistent variability of teacher behavior within programs or experimental conditions on

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targeted as well as non-targeted dimensions of instructional behavior.

The covariation of classroom events means that in many cases, it is impossible to isolate a single instructional variable and manipulate it without also varying other events. A study by Church (1971) provided a good illustration of this. The targeted behavior was "asking open questions" and the experimental variation of that behavior resulted in the covariation of several other events: amount of lesson content covered, type of student responses, frequency of teacher information, etc. Similarly, Miller reported a reciprocal relationship between "asking" behavior and "reinforcement" on the part of Head Start teachers (Miller et al., in press). Nuthall and his associates have concluded that it is probably impossible to conduct classroom experiments in which one variable at a time is manipulated, independent of all others (Nuthall & Church, 1973).

Another consistent finding has been that, regardless of high specificity or structure, intensive training of participants, or other built-in controls, teacher behavior within treatments and within curriculum models is highly variable (Francis, 1971; Miller et al., in press; Morton, 1973; Siegel & Rosenshine, 1972; Wright & Nuthall, 1970). Thus, even though two programs or treatments are significantly different on a given dimension, the assumption that a given treatment is homogeneous or the same for all subjects is rarely true--even in well-controlled experiments. It is in spite of all of these problems and in hopes of resolving or at least further clarifying some of them, that the present study was undertaken.

For this study, the experimental variable was teaching "mode," a fairly global component of instructional behavior. Mode was defined as any combination of two dichotomous aspects of teaching: Group versus Individual contacts and Giving information or stimulation versus Asking for performance. These dimen-

sions combined generate four different teaching modes: Giving to the Group, Asking the Group, Giving to Individuals, and Asking Individuals. Teaching mode was a variable that effectively differentiated four model Head Start programs in an earlier longitudinal comparison study (Miller & Dyer, 1970). There, however, mode was confounded with other program differences, such as materials, learning objectives, etc.

Thus, the present study was an effort to experimentally control and vary teacher behavior apart from, rather than embedded in, total program. It was also intended to determine generally the extent to which the entire instructional setting could be sufficiently controlled while retaining a reasonable degree of generalizability. Along these lines, a crucial component of our research strategy has been to enlist regular teachers as "experimenters" as opposed to using experimenters as "teachers." Hence, in this study the primary task was to train teachers as effective experimenters which meant that, in turn, their task would be not only to implement the experimental variable but also to standardize and control all of the other components of the instructional situation. The intention was to contribute further data relative to the "realities" and limitations of classroom experimentation.

Specifically, the present study was designed to determine the extent to which Head Start teachers in a controlled experimental teaching situation could:

1. adjust a majority of their interactions with pupils to an assigned teaching mode;
2. implement two different teaching modes in consecutive sessions;

¹Mode refers to any of four possible combinations of the two dimensions of teacher behavior mentioned earlier. Giving to individuals, asking individuals, giving to the group, and asking the group are the four possible modes.

3. implement the learning objectives (as specified); and
4. hold lesson content constant over sessions.

Further questions were raised concerning differences between and within treatments. Would teachers implement all three modes at equivalent levels? If not, which mode would be most successfully implemented? Within mode conditions, would teachers differ on the amount of interference² from other modes? When a significant amount of interference occurred in a given mode condition, would the interfering or competing mode be the same for all teachers? In other words, how much homogeneity of teacher behavior can be expected for a given classroom treatment, regardless of whether that treatment differs from other treatments?

Method

Design

A controlled experimental teaching situation was designed in which mode assignment was the independent variable. Each of the six participating teachers was assigned randomly to two teaching modes. There were three pairs of teaching modes, two teachers assigned to each pair. For the experimental sessions, teachers were required to teach a ten-minute lesson twice in two different modes, since a major question was whether teachers could experimentally vary their behavior along specified dimensions, holding lesson content and materials constant.

Figure 1 illustrates the design as well as the format for analysis. The

²Interference was defined as occurring when a teacher produced one or more non-targeted modes during an experimental session at a (single or combined) rate of 20% or higher. Amount of interference is thus inversely related to rate of implementation of the targeted teaching mode--the higher the performance rate on the targeted variable, the lower the amount of interference from non-targeted modes.

Figure 1

Design and Analysis Format

	Assigned Mode					
	Ask Ind.		Ask Group		Give Group	
Alternate	Ask	Give	Ask	Give	Ask	Ask
Assigned Mode	Group	Group	Ind.	Group	Ind.	Group
Teacher #	1,2	3,4	1,2	5,6	3,4	5,6
Teacher Behavior						
Ask/Ind.						
Ask/Group						
Give/Group						
Give/Ind.						

major divisions were the three modes which teachers were asked to implement in this study--the experimental conditions. Since each teacher was assigned to two modes, each teacher appears in two columns--under two experimental conditions. For example, there were four teachers assigned to teach in the Ask/individual mode, two with Ask/Group as their other assigned mode and two with Give/Group. Each of these teachers appears in another column corresponding to her alternate mode assignment. The row categories represent the criterion variables.

For purposes of analysis, the teacher behavior data were grouped first according to the three major divisions or mode conditions and then, according to mode condition by alternate mode condition. The latter breakdown was necessary for answering questions related to within-mode differences as well as questions concerning interference from non-targeted modes.

Data Collection

Implementation of the experimental variables (teaching mode) was monitored by an experienced observer using a reduced form of the DATA-TAPE system during

the experimental sessions. DATA-TAPE is an acronym for Dimensional Analysis by Tape Tallying--Preschool and Elementary, a system designed for monitoring teacher behavior in preschool settings and described in detail elsewhere (Miller, 1973). The major division of DATA-TAPE is between Asking and Giving acts, with Group vs. Individual interactions as a second dichotomy of the system. These dimensions correspond to the teaching modes targeted for the present study.

Video-tapes of each session were collected for the subsequent analysis of lesson content variables. Thus, the implementation of the prescribed learning objective, as well as other aspects of lesson content, was closely monitored.

Teacher-Experimenters

The participants for this study were six regular Head Start teachers--all female, having had an average of 4.7 years of classroom experience. These teachers were recruited from the Louisville, Kentucky Head Start Program and had participated in one or more previous experiments. For the experimental sessions (two consecutive 10-minute lessons), each teacher selected two groups of four children--two girls and two boys for each group.

Training took place in the context of a University of Louisville seminar conducted by the authors on interactional analysis in the preschool. The teachers were introduced to several classroom observation schemes along with DATA-TAPE. After studying the Manual and Tally Sheet on their own, the teachers looked at video-tapes of several Head Start teachers working with children, and practiced categorizing specific teaching acts. They monitored several full teaching episodes, including video-tapes of themselves teaching lessons in their own classrooms. Finally, the teachers practiced actually producing the four teaching modes in micro-teaching sessions.

Experimental Lessons

Twelve objects from the Sigel Sorting Task (Sigel & Olmsted, 1967) were shown to the teachers, as well as several different ways of grouping the items. The set included a ball, a spoon, matches, a tea cup and other familiar objects which could be sorted into categories according to color, function, shape, etc.

Each teacher was instructed to teach a 10-minute lesson on classification to four children in a specified mode (e.g., giving to the group). Then, with a second group of children, she was to replicate the lesson immediately, shifting to her second assigned mode (e.g., asking individuals). Prior to the sessions, each teacher received a set of the Sigel materials and an instruction sheet stating the learning objective, her two assigned teaching modes, and the order in which she should implement the modes. For all teachers, the objective was stated as follows: "This lesson should teach the children that the same objects can be grouped together in at least two different ways." No guidance was provided regarding specific procedures for implementing this particular objective in the assigned modes.

Results

Differences among the three modes (experimental conditions) on each of the criterion behaviors were analyzed by the Kruskal-Wallis one-way analysis of variance technique. This test was selected since the treatment (mode) variances were discrepant on some of the criterion variables. Such an analysis did not consider the fact that the same teacher was observed under two mode conditions. Within-mode differences were treated descriptively because of the small sample size (four teachers in each mode condition).

Table 1 shows mean percentages on teacher behavior for the three mode conditions ($N = 4$ in each). The diagonal boxes show percentages on the targeted criterion variables for each condition.

Table 1

Percentages on Teacher Behavior for Assigned Mode Condition

	Assigned Mode Condition			Kruskal-Wallis
	Ask/Ind.	Ask/Group	Give/Group	
Teacher Behavior				
Ask/Ind.	76.11	11.26	2.25	9.25**
Ask/Group	3.97	62.29	10.49	8.75**
Give/Group	12.69	25.23	85.89	8.33**
Give/Ind.	6.97	1.21	2.09	5.88*

* $p < .05$ ** $p < .01$

Based on previous studies, 50% or above had been set as a reasonable criterion level for a teaching mode to qualify as "successfully implemented" or predominant during a given session. Here, the teachers were quite effective, adjusting an average of 75% of their teaching acts to their assigned modes. In only one session (of a total of 12) was a teacher unable to adjust a majority of her acts to the assigned mode. For all three conditions, the mean performance of teachers on the targeted variable differed significantly from (i.e., was significantly higher than) the mean performance of teachers in the other condition on that same variable ($p < .01$ for all three).

It is also clear that teachers were most successful in the Give/Group condition with nearly 86% of their acts on target. Teachers did quite well implementing the Ask/Individual mode. In the Ask/Group condition, however, the teachers often slipped into Give/Group, or in some cases, into Ask/Individual. This type of interference for pairs as well as for individual teachers will be discussed further.

Table 2

Percentages on Teacher Behavior for Assigned Mode Condition
by Alternate Assigned Mode

Alternate Mode	Assigned Mode Condition					
	Ask/Ind.		Ask/Group		Give/Group	
Teacher #	1,2	3,4	1,2	5,6	3,4	5,6
Teacher Behavior						
Ask/Ind.	90.99	61.23	18.80	3.72	1.43	1.57
Ask/Group	1.41	6.52	65.80	58.74	2.86	18.12
Give/Group	2.33	23.05	14.00	36.45	92.11	79.68
Give/Ind.	4.75	9.18	5.00	1.02	3.59	0.60

Table 2 shows percentages on teacher behavior for assigned mode condition by alternate mode condition. The teacher identification numbers are used here so that it is clear how pairs of teachers performed in both experimental mode conditions. Despite some sizeable differences in the behavior of teacher pairs in their two assigned modes (note, for example, the mean for Teachers 1 and 2 in Ask/Individual compared to when they were in Ask/Group), they were quite capable of shifting from one mode to another in the consecutive sessions. They successfully implemented both modes, and relative success was not related to the order in which modes were implemented in the two sessions. (The order had been balanced to control for this possible effect.)

Table 3

Measure of Lesson Content Implementation

	Ask/Ind.	Ask/Group	Give/Group
$\bar{X}$ number of different groups	6.8	8.5	12.0
X number of times an object was regrouped	4.8	13.8	20.0

Table 3 shows some mode-related differences in content implementation. Data presented here represent average performance of teachers on two content dimensions: (1) the number of different groupings of objects made during the ten-minute session--a purely quantitative aspect reflecting pace and amount of relevant lesson content; and (2) the number of times any object was grouped a different way using a different basis for classification--reflecting more substantively the implementation of the lesson goal. The teachers in the Give/Group condition presented twice as much content in the time period and more than four times as many demonstrations of the actual learning objective. Despite the differences between conditions, teachers in all three to some extent taught to the prescribed lesson goal.

Discussion

It is clear that the teachers implemented their assigned modes. They also were able to shift modes--to systematically alter their behavior on the experimental variable. And, due to their high levels of mode implementation, the three instructional "treatments" were significantly different.

However, due to the amount of variability between and within conditions, we were not able to standardize the instructional situation across treatments. Although in all three conditions the teachers to some extent taught to the prescribed lesson goal (classification), there was a great deal of variability on the two dimensions of lesson content which were measured. Lesson content was not held constant across mode conditions; rather, it varied systematically with teaching mode. Thus, when experimentally varying teacher behavior on the Give/Ask dimension, it would probably be best to consider either the amount of teaching time or the amount of relevant content covered an inseparable aspect of the "treatment."

Further, there was a great deal of variability among the three mode

conditions on the level of implementation for the experimental variable. There was a considerable difference between the Give/Group and Ask/Group conditions. Teachers in the former produced their assigned mode at an average rate of 86% compared to 62% for the latter. It might be possible to control for this by instructing teachers in the Give/Group condition to "lower" their standard somewhat and produce slightly more asking in the experimental sessions. Similarly, some attention to specific strategies or variations on Asking the Group might help teachers in that mode condition to increase their rate somewhat.

Another important source of variability occurred within mode condition. Following the analysis of the main results, we more closely examined the nature and extent of differences within conditions--differences between pairs of teachers with different alternate modes, and differences across conditions for the same pairs of teachers. As can be seen by referring to Table 2 (inserted above), the pairs of teachers within mode conditions performed quite differently not only on the targeted criterion variable, but also on the other criterion measures. This is related to differences in the amount and nature of interference experienced by the pairs of teachers.

Level of implementation on the targeted criterion variable and the amount of interference from "competing" modes are inversely related. Thus, there is very little interference for Teachers 1 and 2 under Ask/Individual and Teachers 3 and 4 under Ask/Group, their implementation level being quite high. For both of these pairs of teachers, interference occurred in only the Ask/Group condition.

The source of interference, however, was different for these two pairs. For Teachers 1 and 2 with Ask/Individual as their alternate mode, the most interference came from Ask/Individual with a significant amount coming from Give/Group as well. For Teachers 5 and 6 on the other hand, nearly all inter-

ference was from Give/Group, which was their alternate assigned mode. A similar pattern occurred for these same two teachers (5 and 6) when teaching in the Give/Group condition. Nearly all non-targeted behaviors occurred in their alternate mode: Ask/Group. The other two pairs of teachers experienced interference in only one mode condition. When interference did occur for Teachers 3 and 4, the source was for the most part their other assigned mode (Give/Group). For Teachers 1 and 2, interference occurred in the Ask/Group condition as was mentioned above, but the source was only partially their alternate assigned mode.

Teachers 3 and 4 were the only pair of teachers whose mode assignments required them to shift or alter their behavior along both dimensions--i.e., to shift from Ask to Give and from Group to Individual (or vice versa). Their performance was considerably lower in the Ask/Individual condition than that of the other pair of teachers; but in Give/Group, they were extremely successful. Thus, the task of shifting on two dimensions did not seem to have a consistent detrimental effect.

Finally, examination of the data at the level of individual teachers revealed a pattern even more consistent than the evidence of interference from alternate assigned modes reported above. In all cases the most powerful source of interference was the individual teacher's habitual teaching mode. For some teachers, this coincided with their alternate assigned mode, and for some it did not. The "habitual" teaching modes for these six teachers were determined through available baseline data from earlier studies as well as our knowledge of their specific background and training experiences.

We are still left, then, with the problem of experimental control in the natural setting. How much control is it reasonable to impose on "laboratory studies" in the classroom? When levels of teacher behavior on certain dimensions are precisely controlled and manipulated and when certain molecular vari-

ables and classroom events are artificially separated or standardized, how generalizable are the results to actual instructional situations? The present study is not sufficient to answer these questions. However, the results obtained point to at least one alternative strategy. It is possible that some of the implementation problems and the high level of variability within treatments could be reduced by first employing experimenters as teachers and later refining procedures for more effectively training teachers as experimenters.

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